

Adaptation of the Regional Forestry Administration to National Forest, Climate Change and Rural Development Policies in Finland

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This paper examines the process of adaptation of the regional forestry administration in Finland to cross-scale socio-ecological changes in national policies and in the forest ecosystem. Self-organisation and knowledge building are the key elements employed in this case study conducted in the Southern Ostrobothnia Forestry Centre to analyse how the knowledge claims and networks are created in order to implement wood energy development projects. The case study method and the theory of adaptive co-management are found to be useful in explaining and understanding policy implementation and outcomes at the regional and local levels. A wood energy project met the forest, climate change and rural development policy targets by facilitating the establishment of a small heating business producing renewable energy from young forest thinnings. The practical outputs at the local level were energy generation from a renewable source; an increase in the area of young forest management; and increased rural entrepreneurship and employment. The unintentional output was that a new wood market arose. As a result of the case study, a two-level network has been introduced as an adaptive policy implementation practice.

Keywords: Two-level network, wood energy, adaptive co-management, self-organisation, knowledge claim.

INTRODUCTION

For Finland to meet its greenhouse gas reduction target under the Kyoto Agreement, fossil fuels need to be replaced with renewable energy sources. Bioenergy became an important instrument as part of Finland's energy and climate policy in the 1990s, when the National Energy Strategy set the goal of achieving a 50% increase in the use of renewable energy by 2010, relative to the 1995 level. Forest fuel alone was to cover one third of this increase (Hakkila 2004). The aim was to increase the amount of forest biomass utilised by 5 M m³ by 2010 (MAF 1999), a target that seems to be attainable because the amount of forest fuel used in energy generation more than doubled between 2000 and 2003, from 0.93 M m³ to 2.11 M m³ (Ylitalo 2001, 2004).

Most of the forest fuel in Finland is provided by non-industrial private forest (NIPF) owners. The population of about 440,000 NIPF owners controls about 61% of the forestland in Finland (FFRI 2003). Industrial forest fuel production is being complemented by efforts to promote a new organisational innovation – co-operative heating – in rural areas, to create small heating businesses usually run by NIPF owners. During the last 10 years about 150 co-operatives and small businesses have been founded to supply heating services for municipal networks and premises, and these now provide fuel for more than 170 heating units throughout Finland. In most cases, the co-operatives procure their fuel from young forests (Peltola 2005).

Finland's 13 Forestry Centres are regional, non-industrial, private forestry advisory and supervision organisations overseen by the Ministry of Agriculture and Forestry (MAF). They have a role both in facilitating the establishment of wood energy co-operatives and in increasing the amount of young forest management¹. The subsidies for thinning of young forests and harvesting and chipping of fuel are based on the *Act for Promoting Sustainable Forestry, 1996*. Young forests should be thinned regularly to improve their growth and timber quality, the annual target for such thinnings being 250,000 ha (MAF 1999). The area thinned has increased in recent years, from 151,000 ha in 1997 to 230,000 ha in 2002 (FFRI 2003), but there is still a long way to go to achieve the goals of wood production.

A number of three-year regional development projects aimed at increasing the utilisation of forest fuel have been carried out since 1995, coordinated in most cases by the Forestry Centres (Peltola 2003). The aim had been to facilitate the establishing of co-operatives and small heating businesses. At the same time, the projects have served as policy tools to promote rural employment and economic development. Finance for this was, and still is, granted in three-year periods from EU structural funds. Many of those projects have been so successful that they are still continuing after eight years (Peltola 2003).

By making use of the project funding, the Forestry Centres have succeeded in implementing three distinct national policies – namely the energy and climate policy, the rural economic development policy and the forest policy – and have reacted to environmental feedback from the forest ecosystem (young growing forests). In this study, a 75-year old traditional forestry organisation (the Southern Ostrobothnia Forestry Centre) and its adaptation to socio-ecological change in the 1990s is researched. The aim of the study has been to research the role of knowledge building and creating networks in this self-organisation process.

Most studies concerning adaptive management deal with cases which include solutions to local or ecosystem-wide environmental problems (e.g. Olsson *et al.* 2004a). In the present case, however, the theory of adaptive co-management is applied more broadly. The author's presumption is that a study of institutions responsible for non-adaptive policy processes is also valuable from the viewpoint of adaptive co-management. It is argued that adaptation to cross-scale socio-ecological change also exist in these institutions.

The next section introduces the theoretical framework of adaptive co-management, and defines the concepts of self-organisation, knowledge building,

¹ This management includes the thinning of sapling stands and early thinning. The former is standard management practice in Finnish forestry, but if neglected there will be no commercial wood (i.e. pulpwood) available from early thinnings. This will result in non-commercial early thinnings, a potential source of energy wood.

networks and *knowledge claim*. The case study setting and research method are then described. Results and empirical findings are reported, and conclusions drawn.

THEORETICAL FRAMEWORK OF ADAPTIVE CO-MANAGEMENT

Policy implementation and natural resource management approaches have been introduced to adapt management practices to the reality of facing up to environmental problems and uncertainty. These include adaptive management (Holling 1984, Lee 1993) and adaptive co-management (Olsson *et al.* 2004a and b). Adaptive management treats economic uses of nature as experiments, so that it is possible to learn efficiently from experience (Holling 1984, Lee 1993). In most cases, it focuses on environmental and ecosystem management by using the most appropriate methods of modelling ecological change under conditions of uncertainty. The social system is managed by consultation, collaboration and social marketing, which are seen as important ‘ingredients’ of adaptive management (Olsen 2000, Schreiber *et al.* 2004). According to several authors (for example Schreiber *et al.* 2004, Bennet *et al.* 2005 and Maguire and Albright 2005), the role of these ‘ingredients’ is to ensure that stakeholders have a broad understanding of the planning situation and a realistic appreciation of management problems, constraints on possible actions and feasible outcomes.

Efforts have also been made to strengthen the social aspect of adaptive management (see Wiber *et al.* 2004). It has been argued that in order to achieve sustainable development and human well-being an understanding of the integrated socio-ecological system is required (Olsson *et al.* 2004a). Socio-ecological systems are complex systems, the inherent features of which are change and uncertainty. ‘The dynamic interpenetration of society and nature presents by a state of ever-changing complexity, spatial and temporal variation, and unanticipated consequences from apparently simple interactions which environmental decision-making procedures are required to accommodate’ (Haila 1998, p. 65). Adaptive co-management may help build resilience in socio-ecological systems and even support ecosystem management, because its aim is to strengthen the capacity of agencies to deal with uncertainty and change and to sustain ecosystem services by monitoring, interpreting and responding to ecosystem feedback (Olsson *et al.* 2004b).

According to Olsson *et al.* (2004a), adaptive co-management systems are flexible community-based systems of resource management tailored to specific places and situations and supported by, and working with, various organisations at different scales. They rely on the collaboration of a diverse set of stakeholders often operating in networks, from local users to municipalities and to regional and national organisations, as well as international bodies (Olsson *et al.* 2004a). Adaptation processes require that actors and organisations have the capacity and opportunities for learning and self-organisation (Lee 1993, Olsson *et al.* 2004a).

In contrast to adaptive co-management, environmental policy and natural resource management are usually implemented by historically constructed organisations and institutions through non-adaptive processes. While in a sense these processes are not merely social constructs, they cannot simply be re-drawn at will (Meadowcroft 2002). While it may be important to establish new organisational frameworks to confront environmental problems, this does not mean that new structures are inevitable. The most effective response may often involve drawing representatives

from pre-existing bodies into a context where a collaborative response to emergent issues can be constructed (Meadowcroft 2002).

Knowledge Claims and Networks

Olsson *et al.* (2004) defined adaptation to socio-ecological change as a self-organizing process that includes knowledge building and the creation of networks across scales (Olsson *et al.* 2004b). March and Smith (2000) provided a more detailed description of a 'network'. *Networks* result from repeated behaviour and they help to create practices. They are to some extent socially and discursively constructed, being structures that define the roles actors play and they prescribe the issues to be discussed and how they are to be dealt with. Thus, in order to understand how a network functions, one has to understand how the actors interpret it and also the broader context within which it is located. The members of a network have personal capacities and possibilities to negotiate and change the network, in terms of its issues and practices and the roles of the members (Marsh and Smith 2000).

The activities of producing knowledge and creating a network are intertwined through a process known as *knowledge building* (e.g. see Olsson *et al.* 2004a, 2004b). This process has two results: a *knowledge claim* and a network that uses this knowledge claim (Åkerman and Peltola 2002). The knowledge claims are units of knowledge which become stabilised through a network of allies. Such allies may be heterogeneous – for example respected scientific or political authorities, established theoretical constructs and prestigious methodologies. As a result, the network may succeed to close the knowledge claim into a *black box*. A black box is an undisputed fact and consequently a valid argument. This underlines the idea that knowledge becomes significant in a social process. Networks, contexts and coalitions are at least equally as important as ideas per se in knowledge production (Åkerman and Peltola 2002). The way in which knowledge claims relate to people and their goals defines the temporal durability of the knowledge. When the context changes, the relevance of the concept needs to be reconsidered.

In the case of the Southern Ostrobothnia Forestry Centre, the knowledge building was a process in which the forest, climate and rural development policies were interpreted and connected with feedback from the forest ecosystem, and it served as a starting point in the response to these socio-ecological changes. Knowledge claims were used to create a network among actors. The questions addressed in the case study are: 1) 'What knowledge claims concerning wood energy (in the form of narratives) have been constructed among the Forestry Centre staff?' and 2) 'What kind of network was created, and how? How does the network work?'

THE CASE STUDY SETTING

Researching the adaptation process requires context-dependent knowledge of the particular situation and conditions. This kind of knowledge can be achieved by the case study method (Flyvbjerg 2001). A case study was conducted in the Southern Ostrobothnia Forestry Centre (subsequently referred to as the Forestry Centre) in western Finland. The Forestry Centre was chosen on the basis of expectations regarding the information content, because the region has a special reputation for

small and middle-size enterprises and has made progress in creating enterprises producing wood and peat energy.

Originally founded in 1929 (Rautiainen 2004), the organisation has 138 employees and acts as a regional advisory and supervision agency for non-industrial private forestry. Its mission is to enforce the *Forest Act 1996* and promote sustainable forestry. In practice this means advising NIPF owners and granting sustainable forestry funds for silvicultural activities including the thinning of sapling stands, forest management planning, the construction of forest roads and the draining of peatlands.

Southern Ostrobothnia has 1.5 M ha of forestry land, 86% under NIPF ownership. The annual growth is about 4.9 M m³, the total growing stock 123 M m³ and the annual cut about 4.1 M m³. The average size of forest holdings is 26 ha. There are 23 local forest management associations operating in the region, which comprises 41 municipalities (Southern Ostrobothnia Forestry Centre 2002). The region is highly dependent on agriculture and forestry as a means of livelihood. It is also renowned for its diverse carpentry industry (Southern Ostrobothnia Forestry Centre 2001).

The aim of the wood energy project is to increase the amount of wood harvested and chipped for use as fuel by promoting small heating businesses. The effects of the project are expected to be seen in rural economic development, improved forest management and more environmentally-friendly energy generation. The aim is to create 15 new jobs and to replace the consumption of 6 M litres of oil with wood fuel (Orava 2004).

The wood energy project offers services to potential entrepreneurs, farmers, and their clients, the latter being mainly local authorities and middle-sized businesses. This takes the form of advisory and education work carried out by three entrepreneurship advisors (Orava 2004). The project is a continuation of a wood energy project implemented during 1997-2000, the main results of which were the starting up of 25 new small businesses and an increase in energy wood production capacity of 48,000 m³ per year (Orava 2000).

RESEARCH METHOD

Data collection consisted of 16 interviews and five observations conducted in March-April 2002, and analysis of various documents collected since 2002. The Forestry Centre staff members were grouped according to their job profiles into experts or supervisors and other employees. The first group comprised experts in forest planning or silviculture and supervisors of the employees. The employees were carrying out the practical work including advising forest owners, marketing and conducting fieldwork for example forest management planning and maintenance of the ditch network on peatlands. The informants were chosen to cover the variety of duties at the Forestry Centre. Also, two informants at the local forest management association operating in the region were chosen to obtain an outside overview concerning the Forestry Centre. The persons interviewed were all male. The semi-structured interviews examined the following themes: informant's duty and work in the Forestry Centre; changes in the work and in the Forestry Centre; history, present situation and future of wood energy issues in Forestry Centre; and connections

between wood energy and informants' duties. Interviews were conducted face to face and lasted from one to two hours. They were recorded and transcribed.

Direct observations were made in five situations: two meetings between Forestry Centre staff and councillors and the administrators representing local municipalities; a meeting concerning forest management planning; a meeting of the advisory board of the wood energy project; and a consultation between a forest advisor and a forest owner. The documents used included the Regional Forestry Programme, reports produced by the wood energy project, yearbooks of the Forestry Centre and other statistical reports.

A narrative approach was used as a means of analysing the course of the social constructive and communicative processes entailed in the building of networks and knowledge. *Narratology* is understood as answering the question of 'how best to get an honest story honestly told' (Flyvbjerg 2001). The tracking of the knowledge-building process is based on the assumption that people tend to make sense of things in the form of stories, piecing together events and imputing motives, agency and roles, rather than in terms of static characteristics (Crang 1997). Thus, when looking for narratives from the data, the analysis focuses on finding the 'grand level' or *meta narrative* of the Forestry Centre or wood energy project. From the viewpoint of the employees interviewed, they would have noticed changes in their work, i.e. new knowledge would have been used and a reorganisation in the work would have emerged. The stories concern the progress made in the use of wood as a fuel or the management of young forests, for example. Analysing the narratives of these changes is the key to finding the construction of new knowledge claims and of the network. The interviews and other data are treated as *speech acts*, which the actors use to construct the knowledge claims and to describe the network.

The analysis included the following steps. First, the themes were decided and the data coded. These were: 'history' (of the wood energy and the Forestry Centre), 'projects', 'forest management planning', 'extension' (both silviculture and wood energy), 'law-enforcement' and 'others'. All themes were then analysed in greater detail. The data were re-coded so that three categories remained, namely 'narrative of the Forestry Centre and the wood energy projects', 'the theme of wood energy' and 'the discourse of good forest management'. This paper concentrates on the detailed findings concerning the narrative and the wood energy theme. The narrative was re-coded in 13 chronological steps. The knowledge claims were re-coded from the wood energy theme. The discourse of 'good forest management' will be analysed in another research article (Leskinen 2006).

KNOWLEDGE CLAIMS AND TWO-LEVEL NETWORK

Knowledge Claim: The Southern Ostrobothnia Forestry Centre as an Impartial Rural Developer

At present the duties of the Forestry Centre are to supervise observance of the forestry legislation, to promote sustainable forestry and to participate in the development of regional forest-based economies (Interviews 3 and 7, Decree concerning Forestry Centres 1996). Before reaching this point, however, the Forestry Centre went through several structural changes. In 1987, the Regional Forestry Board District and Regional Forest Improvement District were merged to

form the Forestry Board (Interviews 3 and 12, Tapio 1988). One reason for this was a decrease in the need for forest improvement work including the building of forest roads and the ditching of peatlands (Interview 15). In this process the number of staff was reduced, mostly through retirement (Interview 14). The Forestry Board was again reorganized in the 1990s because of the economic recession and the state budgetary crisis (Interviews 3 and 12), to become the Forestry Centre. Some staff members were dismissed (Interview 4) so that the number decreased from 110 in 1988 to 79 by 1997 (Figure 1). Moreover, the Central Ostrobothnia Forestry Centre was abolished, and part of it was merged with the Southern Ostrobothnia Forestry Centre (Tapio 1998).

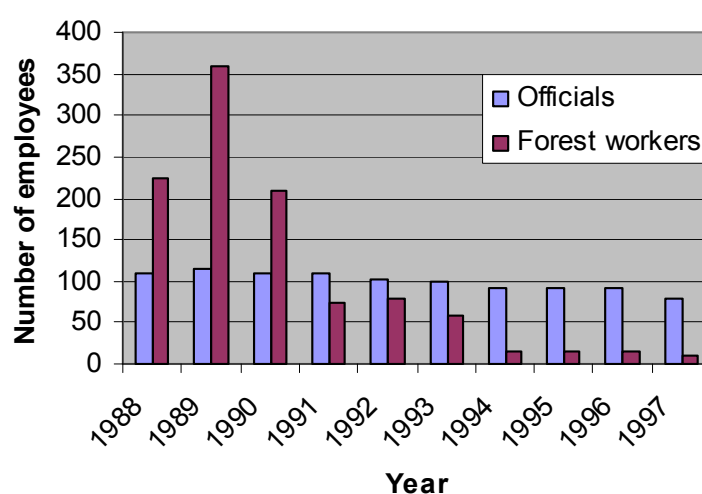


Figure 1. Number of employees at the Southern Ostrobothnia Forestry Centre, 1988-1997

In 1995, Finland joined the EU and the Regional Development and Employment Centres started to grant EU structural funds. Because Finland pays more to the EU than it receives in benefits, it became a national (or at least regional) 'mission' to use all the EU structural funds available (Interview 3, see also Valve 2001, 2003). In this situation, the development projects proposed by the Forestry Centre were welcomed by the Regional Development and Employment Centre.

Development projects provided an opportunity to relieve the budgetary shortfalls of the Forestry Centre (Interviews 5 and 7). New employees were recruited, and at the same time new expertise obtained, thanks to the project funding (Interview 2). The organisation took on a new role as a more versatile producer of services (Interview 3, 4, 7, 12, 14 and 15). Moreover, wood energy as a renewable energy resource gave the Forestry Centre a positive image (Interviews 4-8, 10 and 14).

It was originally intended to implement development projects promoting small-scale mechanical wood-processing businesses, because this was seen as a promising opportunity for regional economic development. Four employees of the Forestry

Centre were trained as wood-processing engineers (Interviews 4 and 8) and several development projects were implemented.

The wood-processing projects were successful, and the wood energy projects performed even better. According to the interviews, the idea and initiative behind the wood energy projects came from regional actors (Interviews 10 and 13). The rise in oil prices (Interview 2–4, 6 and 11) and the emphasis on environmental issues (Interview 3) were the main reasons for the growing interest in wood energy. The Forestry Centre came to the conclusion that there were several reasons why wood energy development projects were more appropriate for the organisation than mechanical wood-processing development projects. The foresters and forest engineers – and thus the majority of the Forestry Centre staff – were familiar with wood energy (Interview 7), whereas an effective understanding of the mechanical wood-processing industry would require the training of a wood-processing engineer. Also, becoming a heat entrepreneur was a more natural choice for a forest owner than becoming a joiner (Interview 8), in that typically farmer forest-owners already had the necessary machines and working skills. Finally the argument that wood-processing entrepreneurs such as joiners are not always forest owners meant that the clients who were the targets of the advisory work were no longer from ‘the field of forestry’ (Interview 8).

It is more difficult for the farmer or another actor to become a joiner than a heating entrepreneur. The joinery industry requires different know-how. Driving a tractor, logging and chipping is like an old routine. Of course, our entrepreneurship advisors also promote joinery, but the customers are a little bit different. They are no longer a forestry target group. Instead they are an entrepreneur target group... (Interview 8)

In summary, for the purposes of receiving project funding, a knowledge claim was built up that the Forestry Centre organisation is the most natural choice for wood energy projects, because of its prior familiarity with the substance (forests) and the clients (farmer forest owners).

According to Forestry Centre staff, promoting the utilisation of wood is a duty of the centre, alongside promoting rural development and employment, for several reasons (Interviews 3, 4, 6, 7, 15 and 16). First, the organisation that administrates the EU funding, the Regional Development and Employment Centre, cannot implement such projects by itself, because of a lack of organisational resources (Interview 6). As a state administrative organisation, the Forestry Centre has the expertise to coordinate and administrate the EU funding bureaucracy. Second, the projects usually geographically concern the whole region or at least an area covering several municipalities (Interviews 4 and 13). Thus the sizes of the projects are suitable for the Forestry Centre but too large for a single municipality or a local forest management association. Third, the Forestry Centre organisation is regarded as being impartial (Interviews 6 and 10), and does not have the same kind of problems regarding trust as a local council when coordinating a project involving several municipalities (Interview 9). Other situations demanding impartiality are co-operation with representatives of the wood-based heating technology industry, and facilitation of negotiations between the heat entrepreneur and the local authority

(Interview 6). In other words, there was a knowledge claim that the Forestry Centre organisation is both a regional development organisation and an impartial one.

I think that impartiality has worked in our relationships with the local authorities and (heating technology) enterprises. But you have to be awake when the situation goes beyond the bounds ... sometimes negative feedback will come, e.g. if an enterprise's logo was not visible ... or if a co-operative bought a heating boiler from a competitor ... They are only joking ... but they usually mention this anyway ... (Interview 6)

Knowledge Claim: Wood Energy Markets Activate Local Forestry

Most investments in forestry yield profits after a long period of time, particularly from the viewpoint of a private forest owner. However, by ensuring a high level of sustainable cuttings in the long run, investments can be made profitable from the viewpoint of the national economy. Originally, the idea of state subsidies for forest management work was to ensure that the forest management that was economically desirable for the national economy was also profitable for the individual forest owner. Thus the Forestry Centre had a *national mission* from the 1960s to the late 1980s to promote sustainable wood production for the benefit of both individual forest owners and the whole nation. More recently, forestry professionals have reconsidered how private forest owners experience the profitability of forestry, as exemplified in the quote:

A forest owner is not interested in investing in his forest if forestry is not profitable. And a forest owner earns money from selling wood. Consider cash flows ... if we illustrate income by the number 80, then 20 represents the costs. Thus the proportion is this. In that case, even if costs are cut as much as possible, which should be done, naturally, it will not help much. What is crucial for profitability is the income. (Interview 3)

Between the 1960s and 1980s, large areas of forest were regenerated by cuttings to provide raw material for the forest industry. Sustainable wood production was promoted by a considerable amount of planting. Consequently, the difference between the area of thinning the sapling stands needed and the implementation area is almost 6,000 ha per year in Southern Ostrobothnia and the corresponding figure for early thinnings is almost 9000 ha per year (Tomppo *et al.* 1998, Table 1).

The bottleneck for early thinnings is that the forest industries prefer not to purchase pulpwood from these young forests (Interview 9). Marketing problems and the low price paid for pulpwood have made selling of wood from thinning sites as energy wood an attractive alternative (Interviews 2, 10 and 13). Young forest thinning subsidies, energy wood harvesting subsidies, energy wood chipping subsidies and the incomes from the sale of energy wood should together cover at least the cost of the early thinning. In the best cases, the sales revenue can be even higher than that obtained from pulpwood. In such cases, advantage is taken of all the available subsidies and pulpwood and other small-diameter wood is sold for energy purposes, with some timber sold to sawmills.

Table 1. The need for management of young forests in Southern Ostrobothnia and its realisation, according to the latest National Forest Inventory results

Realisation in 1993–1997 (ha/year)		Thinning needed for years 1998–2002 (ha/year)	
Thinnings of sapling stands	13,620	Thinnings of sapling stands	19,440
Early thinnings	11,580	Early thinnings	20,540

Source: Tomppo *et al.* (1998).

Most of the Forestry Centre staff members believe that wood energy projects also promote early thinnings by creating new markets for small-diameter wood (Interviews 2, 3, 5 and 8–14). Another important effect attributed to energy wood is that it limits deflation in the price of pulpwood (Interviews 6, 9 and 11). Even though the financial profitability of harvesting energy wood is totally dependent on state subsidies, high expectations are placed on it. Because wood is a competitive energy source to oil, increases in the price of oil during the period covered by the interviews promoted these expectations (Interviews 2, 4, 6–8 and 11).

Since the problem with early thinnings is so extensive that energy wood alone cannot solve it (Interviews 2 and 8), what then is the rationale behind the wood energy market? The answer is that it is a solution that has many small positive effects. Forest owners are activated by energy wood harvesting (Interviews 6 and 9), which means that they will be more likely to undertake other forest management work, in other words invest in their forests, and the employment situation in forest management associations will be improved by an increase in early thinnings (Interview 6). Further, forest owners have better opportunities for growing timber of higher quality (Interview 2 and 10). This can be achieved by dense stocking of young sapling stands, which means that only a small amount of pulpwood or timber will be available in the early thinning phase, but energy wood can still be harvested.

The wood energy market is an alternative to selling pulpwood and represents potential opportunities of increased sales income for forest owners, cost-effective forest management and greater rural employment. These expectations constitute the knowledge claim of ‘active and profitable forestry’, which is also a practical interpretation of the policy aim of ‘rural economic development’.

The local heating plants have positive employment effects, and they increase incomes and economic activity. These things are important from the viewpoint of rural livelihoods. (Interview 15)

Creating a Two-level Network with the Forestry Centre as a Mediator

EU structural funding presupposes the existence of a number of other funding sources, for example local authorities and industry. Thus, to produce successful funding applications, the Forestry Centre has to convince several actors of the value of the wood energy project. The knowledge claims introduced in the previous section can be used for this purpose. An important stakeholder that is committed to these knowledge claims becomes a member of the network, and when there is a credible network supporting the application, the Forestry Centre has a high

probability of having the wood energy project approved by the Regional Employment and Economic Development Centre.

From the viewpoint of the Forestry Centre, the most important issues concerning the municipalities are these EU-funded projects. The truth is that the local authorities decide what kinds of projects are funded. The reason is the structural fund system, for which about 5% of the project budget has to come from local authorities. Thus, the local decision-makers can push through the projects that they prefer by maintaining this 5% contribution. I do not know, but I imagine that this must have been the original purpose (of the EU structural funds). (Interview 3)

One solution to the challenge mentioned above has been the Forestry Centre practice of organising meetings in every municipality in its region (Interview 2 and 3) to explain continuing projects, introduce new ideas and provide information on wood energy. As a consequence of this practice, the local authority representatives become convinced that there is more than enough raw material for energy generation in the forests (Interview 3 and 6), and are assured of the benefits of wood energy in the form of better forest management, increased entrepreneurship, investment subsidies for wood heating technology, and multiplier effects on the local economy (Orava 2002, Observation 1 and 5).

Together with the knowledge claims and apparent advantages of wood energy, the Forestry Centre creates the network required for its wood energy project together with the local authorities, industry and the Regional Employment and Economic Development Centre. The knowledge claims that 'the Forestry Centre organisation is the most natural choice for wood energy projects' and that 'the Forestry Centre organisation is a regional and impartial development organisation' ensure that it receives the task of managing the project.

Thanks to these EU-funded projects, a new profession has been created within the Forestry Centre organisation – that of an entrepreneurship advisor – with the task of supporting the establishment and development of small heat enterprises and co-operatives, as well as promoting the idea of using wood energy and replacing oil with wood as the heating fuel for local authorities and small and medium-sized companies (Interview 6). The main target is nevertheless the local authorities, for the purpose of starting a political process of switching the district heating systems over to this fuel.

So the starting point is that nothing happens if nobody knows anything. The first thing to do is to inform the local authorities. The conclusive factor is whether the entrepreneurs decide to promote the idea and to work actively and purposefully for it. (Interview 6)

In a particular municipality, the entrepreneurship advisors will also introduce the local forest owners to the idea of energy wood for heat generation, in order to find entrepreneurs to make offers to supply heating energy to the local authority. They will support a potential entrepreneur in many ways – such as with information about investment grants available for small entrepreneurs and assistance in making investment and offer calculations – and will even provide 'moral support' in negotiations with the local authorities (Interview 2 and 6). This support is an

important contribution, because a farmer forest owner may have a sound knowledge of energy wood harvesting (i.e. the substance itself) but no experience concerning contracts and other relevant paperwork (Interview 6).

The main efforts entailed in the project lie in promoting the idea of wood energy and in facilitating the decision-making processes of energy consumers (for example local authorities) and suppliers (i.e. forest owners). The wood energy project aims to be a facilitator of processes, the desired conclusion being that local actors (i.e. farmers) should start to supply fuel (i.e. forest chips) from their own forests to meet the needs of the local municipality (Interviews 5, 8, 11 and 12). The anticipated result is a lower-level network. The idea of wood energy is related to the knowledge claim of 'the active and profitable forestry', and this may motivate the local authorities to pay a little extra for their wood energy and serve as a driving force for the entrepreneurs. One main tool among the investment grants for motivating potential heat entrepreneurs is the forestry subsidies for the thinning of young forests and the harvesting of energy wood.

According to an entrepreneur advisor, one highly important condition is that there should be at least one key person who regards the idea as a desirable opportunity (Interview 6), preferably a leading personality who can encourage others to join the project and who can assume responsibility. In some cases, a heat entrepreneur or co-operative may launch an operation, but mostly, if no key person appears then nothing happens. The result in terms of a lower-level network is thus ultimately dependent on the local conditions, and the project can only facilitate the process.

CONCLUSIONS

This case study illustrates the process of adaptation of the Forestry Centre organisation to national policies, perceived through the concepts of self-organisation and knowledge building. As the result of self-organisation, a two-level network has been created, the upper-level between the local authorities, industry and the Regional Employment and Development Agency in order to create the project itself, and the lower-level to promote the consumption and supply of wood energy locally. Basically, the upper-level network represents policy implementation at the regional level (in practice project management) while the lower-level represents policy implementation at the local level, where the policies were ultimately realized in concrete practices and outcomes.

One basic characteristic of the lower-level network is that local conditions dictate whether the network is created. The appearance of a key person is an example of such local conditions. This is consistent with the idea of *initial* and *boundary* conditions from inter-level analysis (Haila 1998). The aim is to create boundary (in this case, regional) conditions of a kind that will stimulate the creation of wood energy co-operatives as a result of the initial (in this case, local) conditions.

The two-level network is a policy implementation tool, but the question is whether it is a successful tool. Wood energy projects were expected to promote aims conforming to three national policies: climate change policy, forest policy and rural development policy. The first of these, climate change policy, has been almost invisible and has become apparent only at the regional level, when wood energy has represented a tool for reducing oil consumption and promoting the use of renewable

energy sources. Perhaps paradoxically, the policy aim has been promoted largely as an outcome of the project. The objective of replacing oil consumption by wood energy (the target level was 6 M litres) was in fact achieved to a greater degree than had been expected (a realisation of 8.7 M litres) (Orava 2004). The study reveals that slowing down climate change is not an intentional aim of the network, but rather climate change has been used as an opportunity to promote other aims, such as rural economic development and forest policy. The idea of using wood energy was not new and because the members of the network had time to develop their proposals and wait, climate change was a problem to which they could address their solution.

Unfortunately, the effectiveness of the wood energy project in promoting a sound forest management aim (to increase the amount of thinned young forests) can be assessed only indirectly, but data provide some idea of the situation. Thinnings of young forests increased from under 5000 ha during 1994 to 1997 to average 8000 ha per year over 1998 to 2003. One reason for the change could be the implementation of the wood energy projects, which have been running since 1997 (Orava 2000). The volume of energy wood procured from young forests is also considerable; out of the total about 150,000 m³ of energy wood procured in Southern Ostrobothnia in 2003, 48,000 m³ or almost a third was from young forests.

In terms of the third policy aim, the motivation of the Forestry Centre was to strengthen its own role as a regional development organisation, and for its own sake it needed to seize the opportunity to generate these development projects and implement them successfully. This was done by creating the two-level network and acting as mediator between the levels. The Forestry Centre organisation and its network promoted the policy aim of rural economic development by achieving an increase in the number of jobs (the realisation was 74 continuing and 29 new jobs) and entrepreneurs (a realisation of 18) (Orava 2004).

It became apparent that there was no intentional move towards more adaptive co-management in the Forestry Centre, but rather the driving forces to self-organisation were budget cuts and a chain of reorganisations. The study shows that interesting findings emerge if the framework of adaptive co-management is used in research into adaptation processes in conventional, 'non-adaptive', policy implementation structures.

However, the two-level network has been created alongside the Forestry Centre organisation and the traditional activities of the regional forestry administration. The future development of the two-level network is crucial for the adaptation process. The challenge is to integrate the entrepreneurship advisors' work with the routine work of the forestry administration. The integration would require changes in, for example, forest management planning practices and in the national policy run by the Ministry of Agriculture and Forestry. If this is not successful, it is possible that the two-level network would disappear when EU structural funding ceases.

The framework of knowledge-building as an intertwined process of producing knowledge and creating a network (as described by Marsh and Smith 2000, Åkerman and Peltola 2002 and Olsson *et al.* 2004a, b) was in this case found to be a useful analytical tool for studying the implementation of national policies at the local level. The network was the two-level network and the knowledge claims were 'the Forestry Centre organisation is the most natural choice for wood energy projects', 'the Forestry Centre organisation is a regional and impartial development organisation', and 'active and profitable forestry'. Furthermore, the framework takes

into account the discursive nature of network creation and the importance of members' interpretations concerning the network, its context and their roles in it. Thus specific conclusions can be made concerning the consequences of committing oneself to the particular knowledge claims. Some options were closed by the discursive construction of the knowledge claim that 'Forestry Centre organisation is the most natural choice for wood energy projects' and other options were opened up. Wood energy is almost too a comfortable choice for the Forestry Centre. The entrepreneurs are forest owners, i.e. the projects have the same clients as the Forestry Centre usually has, and wood procurement and the management of young forests are also well-known activities in the organisation.

One aim of the further studies will be to analyse the possibilities of new discursive constructions in the forestry centre organisations. In order to confirm the knowledge claim that 'the Forestry Centre organisation is a regional and impartial development organisation', the issue of what rural development and forest-related industry means could be considered in a wider context. The Forestry Centre should not concentrate too much on wood energy, but should consider all means of utilising and processing wood. Moreover, other ways of using forest resources could be taken into account, for example nature tourism. Thus the Forestry Centre organisation could strengthen its role as a regional rural developer by, for instance, recruiting wood-processing engineers and tourism experts. These alternative interpretations and constructions of knowledge would mean that forestry and forest owners would not be the only clients of the organisation, but that these would include (small and middle size) enterprises based on, for example, wood and forests.

An interesting finding is the knowledge claim of 'the active and profitable forestry', because this has created a new local-level policy aim of creating new potential economic activities in local non-industrial private forestry and by that means increasing the profits obtained from forestry. The key is to ensure a particular price level for small-diameter wood. This represents a new solution to the problem of low profitability of forestry. The low profitability problem has also been acknowledged by the Future Forum on Forests, a supporting tool for Finland's national forest policy. The Future Forum suggests as a solution, however, cutting the costs of forest management or increasing wood production volume (Niskanen 2005). The National Forest Programme also has an alternative interpretation.

The profitability of forestry has improved during the second half of the 1990s due to an increased amount of harvesting. During the period of 1970–1997 the average real net profit per hectare was EUR 77 whereas in 1997 and 1998 it amounted to EUR 98. Increasing the production for industrial roundwood to 63–68 million m³ would produce a rise in stumpage price earnings by a total of approx. EUR 100–250 million which would equal an average net profit of EUR 103–104 per hectare. (MAF 1999)

The ambiguous constructions of the profitability of the forestry – which can be increased by new incomes, by cutting costs and increasing production volumes, or by increasing harvesting volumes – point to the strength of the analysis of knowledge building and claims. These ambiguous constructions may affect policy implementation by causing incoherence and misinterpretation in policy follow-up and evaluation. From the viewpoint of adaptive management, the challenge is how

the feedback from the local implementation level can be made to reach the policy-making level for the purpose of promoting policy adjustments. There is a crucial need for future research in order to obtain a more detailed analysis of the key elements of forest policy (for example knowledge building concerning the profitability of forestry). Such research would also support the monitoring, cross-scale coordination and re-evaluation of forest policy (Lee 1993, Olsson *et al.* 2004a).

The knowledge claim of 'the active and profitable forestry' is a local, practical interpretation of rural economic development, so that the actions motivated by it are the outcomes of the rural economic development policy. So what is the relevance of these outcomes? The lower-level networks supplying and consuming wood energy have little influence compared with the quantitative targets of the national climate, rural development and forest policies, but they do have local and qualitative impacts. A potential exists for the diversification of the economic landscape of forestry (Peltola 2005). The members of wood energy co-operatives are *knowing agents* who have an economic impact. This qualitative change from passive wood-seller to economic actor could be seen as an important social aspect of sustainability. Moreover, local economic practices create a potential, a well-developed solution waiting for a policy window to open up in the future (Olsson *et al.* 2004b). Thus there might be potential quantitative policy effects.

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